2012 UDOT RESEARCH PROBLEM STATEMENT

Problem Title: Environmentally Friendly and Sustainable Stream Stability in Vicinity of Bridges **No.:** 12.05-1

Submitted By: Rollin H. Hotchkiss **Organization:** Brigham Young University

Email: rhh@byu.edu **Phone:** 801-422-6234

UDOT Champion (suggested): Denis Stuhff, Jerry Chaney, Jim Baird, Tim Ularich **Group/Region/Division:** Hydraulics

1. Describe the problem to be addressed.

The Department is directly responsible for insuring the safety of 1250 bridges over streams and the stability of ~400 miles of stream banks adjacent to State highways. Every such bridge and every adjacent stream bank is subject to scour forces and potential damage from floods of all magnitudes. State and federal regulatory agencies often request that UDOT install rock weir structures and bank stabilization measures normally used only in river restoration projects unconstrained by roadway crossings. These weir structures do not account for large flood events and/or entrenched channel conditions and often fail. Traditional scour protection designs frequently require mitigation measures to replace impaired stream functional values.

Currently there is no integrated design procedure available to all agencies that provides the required scour protection while maintaining stream functions.

Gene Shawcroft, Central Utah Water Conservancy District, gene@cuwcd.com, endorses this project.
Craig Walker, Utah Division of Wildlife Resources, also endorses this project.

2. Describe why this research is important and how it is unique.

By creating a fully integrated design procedure, designers will be able to evaluate and design in stream weir structures and bank stabilization measures for effectiveness and long term performance that also provide needed environmental benefits.

3. List the research objective(s) to be accomplished:

1. Document inherent weaknesses and strengths in current procedures being used by UDOT & regulatory agencies
2. Develop an integrated design procedures that combines scour protection with environmental benefits

4. List the major tasks to accomplish the research objective(s):

1. Review current literature and UDOT and regulatory agency project reports (finished and current) to document weaknesses and strengths
2. Develop a design procedure based on engineering principles that maintains or improves existing environmental conditions.
3. Apply in a field pilot study (based on availability of additional funds or funds from an existing project)
4. Prepare the project report.

5. List the deliverable(s) to come to UDOT from this research study:

1. Project Report that includes a design procedure that combines protection and environmental benefits
2. Pilot Field Study or Studies (presuming funding is available from an existing project)

6. Describe how the results of this study will be implemented at UDOT.

Project results can be used to design bridge protection structures and bank stabilization measures that both provide protection at design flood levels while providing for environmental benefits.

7. Estimated cost - Total: $60,000 **UDOT Share:** $60,000 **Matching Funds:** $0

8. Outline the proposed schedule for this study, including estimated start date, duration, and major event dates.

This project will require eighteen months to complete. It would be best to include two summer seasons, the first being used to visit field sites and the second for installing a pilot project (pending availability of funds from another project). Task 1 will require six months to complete and will include a progress report detailing current practice around the country and within UDOT and regulatory agencies. Task 2 will begin three months into the project and last for 9 months. Task 3 (if funding is available from another project) will begin as soon as possible and continue until project completion. The project report will be finalized during the last six months of the project. To summarize

Task 1: month 1 to month 6
Task 2: month 3 to month 12
Task 3: month 10 to month 18
Task 4: month 13 to month 18

Cross vane failed causing scour under bridge and stress on banks